Rupture Process of the 2004 Chuetsu Earthquake Obtained from Strong Motion Data of K-NET and KiK-net

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So called the 2004 Chuetsu earthquake which occurred at mid Niigata prefecture 17:56 on 23 October 2004 (JST) caused serious disaster around the source region. We deduced the rupture process of the earthquake with strong ground motion data obtained by nation-wide strong motion networks, K-NET and KiK-net. Since velocity structures beneath the source region had deep sedimentary basin, we modified velocity structures for the analysis using waveforms of aftershocks. We assumed three characteristic velocity structure models corresponding to beneath the hanging wall, the foot wall, and Ojiya city. Theoretical Green's functions were calculated by the discrete wavenumber method (Bouchon, 1981) and the R/T matrix method (Kennett and Kerry, 1979) with the three velocity models.   We assumed a fault model of 42 km x 24 km with the strike and dip angles, N211E and 52, respectively. The fault plane was divided into 252 subfaults, each 2 x 2 km. Convolution of moving dislocation was introduced to represent the rupture propagation in a each subfault (Sekiguchi et al., 2002). For the analysis, we used strong motion data from 9 stations of K-NET and KiK-net. The observed acceleration records were integrated into velocity and bandpass filtered between 0.1 and 0.67 Hz. We inverted 10s of the S-wave portion from 1 s before the S-wave arrival.

As major asperities, the largest slip of 3.5 m occurs at the hypocenter and another notable slip appears at the shallower part. An additional small asperity at southwest of the hypocenter plays an important role to explain characteristic waveforms which is widely observed around southwest of the source region. The propagation velocity of the first-time-window triggering is 2200 m./s. Our estimation of the total seismic moment is 1.2x10^19 Nm which corresponds to Mw = 6.7.